



PATENT

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Lisa D. Bronk

Appl No.	: 09/775,315	Confirmation No. 8247
Applicant	: Hyun-Sook Jung, et al.	
Filed	: February 1, 2001	
Title	: POSITIVE ACTIVE MATERIAL FOR RECHARGEABLE LITHIUM BATTERY AND METHOD OF PREPARING SAME	
TC/A.U.	: 1745	
Examiner	: Julian A. Mercado	
Docket No.	: 41671/DBP/Y35	
Customer No.	: 23363	

DECLARATION UNDER 37 CFR § 1.132

Commissioner for Patents
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November 29, 2005

Commissioner:

I, Hyun-Sook Jung, hereby declare that:

1. I received a bachelor's degree in chemistry from Han-yang University in 1996 and a master's degree in chemistry from KAIST in 1998. I have been employed by Samsung SDI Co., Ltd. since 1997. My responsibilities include research in the area of lithium ion batteries, and I consider myself an expert on positive active materials for lithium ion batteries.

2. A lithium ion battery cell was fabricated in the same manner as set forth in Example 4 of the present specification at page 13, lines 4 to 17, except that the positive active material was prepared by mixing LiMnO₂ and Li_{1.03}Ni_{0.8}Mn_{0.2}O₂ in a weight ratio of 2/8.

3. Another lithium ion battery cell was fabricated in the same manner as set forth in Example 4 of the present specification at page 13, lines 4 to 17, except that the positive active material was prepared by mixing LiMnO_2 and $\text{Li}_{1.03}\text{Ni}_{0.8}\text{Mn}_{0.2}\text{O}_2$ in a weight ratio of greater than 1.

4. The lithium ion battery cell was charged and discharged according to the procedure set forth in the specification for examples 4 to 7 at page 14, line 23 to page 15, line 5. Namely, charge and discharge cycles were carried out once at 0.1C, three times at 0.2C, 10 times at 0.5C and 100 times at 1C between voltage limits of 4.3 and 3.0V. The discharge capacity of the lithium ion battery cell including the positive active material having a weight ratio of oxides of less than 1 was measured and the results are shown in the following table.

Ratio of Mn oxide to Ni-Mn oxide	Discharge Capacity (mAh/g)
Greater than 1	142
2/8	179

5. As can be seen from the table, the discharge capacity of the cell containing a positive active material according to the invention, i.e. having a weight ratio of oxides less than one, is superior to that of a cell containing a positive active material having a weight ratio of oxides greater than one. In my opinion, the superior results achieved using the inventive positive active material were unexpected.

6. Comparative Example 1 - A half-cell was fabricated by first preparing a physical mixture of $\text{Li}_{0.98}\text{Ni}_{0.82}\text{Co}_{0.18}\text{O}_2$ and $\text{Li}_{1.05}\text{Mn}_2\text{O}_4$ in a weight ratio of 90:10 wt%. The physical mixture was prepared by mixing $\text{Li}_{0.98}\text{Ni}_{0.82}\text{Co}_{0.18}\text{O}_2$ with $\text{Li}_{1.05}\text{Mn}_2\text{O}_4$ in a mortar.

7. Comparative Example 2 - a half-cell was fabricated as in Comparative Example 1, except that the weight ratio of $\text{Li}_{0.98}\text{Ni}_{0.82}\text{Co}_{0.18}\text{O}_2$ to $\text{Li}_{1.05}\text{Mn}_2\text{O}_4$ was 80:20 wt%.

8. Comparative Example 3 - a half-cell was fabricated as in Comparative Example 1, except that the weight ratio of $\text{Li}_{0.98}\text{Ni}_{0.82}\text{Co}_{0.18}\text{O}_2$ to $\text{Li}_{1.05}\text{Mn}_2\text{O}_4$ was 70:30 wt%.

9. The charge and discharge characteristics of Comparative Examples 1 to 3, above, and Examples 1 to 3 described in the specification at page 9, line 21 to page 10 line 23 were measured. The charge and discharge cycles were carried out one at 0.1 C, three times at 0.2 C, 10 times at 0.5 C and 100 times at 1 C between voltage limits of 4.3 and 3.0 V. The charge and discharge characteristics are listed in the following table.

	Weight Ratio of Ni-Co Based Material / Mn Based Material (wt%)	Discharge Capacity (mAh/g)	Mid-discharge Voltage (18 mAh/g reference, V)	Overall Results
Example 1	9/1	171	3.812	Good
Example 2	8/2	158	3.881	Good
Example 3	7/3	154	3.889	Good
Comparative Example 1	9/1	158	3.792	No good
Comparative Example 2	8/2	162	3.792	No good
Comparative Example 3	7/3	145	3.839	No good

10. As can be seen from the table, the discharge capacities and mid-discharge voltages of the cells containing chemical mixtures according to the invention, are superior to those cells containing physical mixtures of oxides. In my opinion, the superior results achieved using the inventive positive active material were unexpected.

11. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

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Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date Nov. 28, 2005

By Hyunsook Jung

Hyun-Sook Jung

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